

REPORT DOCUMENTATION PAGE			Form Approved OMB No. 0704-0188	
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1. AGENCY USE ONLY (Leave blank)	2. REPORT DATE 7/1/99	3. REPORT TYPE AND DATES COVERED annual 9/1/98 - 6/30/99		
4. TITLE AND SUBTITLE Characterization of Biologically Produced Colored Dissolved Organic Matter		5. FUNDING NUMBERS Grant # N00014-98-1-0579		
6. AUTHOR(S) Daniel J. Repeta				
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Woods Hole Oceanographic Institution Woods Hole, MA 02543		8. PERFORMING ORGANIZATION REPORT NUMBER		
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES) Office of Naval Research 800 N. Quincy St. Arlington, VA 22217-5660		10. SPONSORING/MONITORING AGENCY REPORT NUMBER		
11. SUPPLEMENTARY NOTES				
12a. DISTRIBUTION/AVAILABILITY STATEMENT approved for public release - unlimited distribution		12b. DISTRIBUTION CODE		
13. ABSTRACT (Maximum 200 words) <p>Long term Research Objective: Colored dissolved organic matter (CDOM) is one of the principal light-attenuating components of seawater. Over the past decade considerable progress has been made in describing the optical properties of CDOM. However, our understanding of CDOM structure and chemistry has not advanced apace, and we do not yet understand many of the factors that introduce and remove CDOM in seawater. Our objectives are to chemically characterize CDOM and to develop techniques for studying CDOM cycling in seawater. Recent work suggests that a large fraction of marine DOM consists of complex carbohydrates and proteins that are produced directly from biosynthesis, yet are biologically refractory towards microbial degradation. Previous studies have also suggested that a large fraction of CDOM is associated with biological activity. We wish to determine if marine phytoplankton and bacteria produce significant quantities of CDOM, and to compare the chemical characteristics of biologically produced CDOM with CDOM in seawater.</p>				
14. SUBJECT TERMS CDOM, DOC, DIC, microbial, genes, sequencing		15. NUMBER OF PAGES 2		
		16. PRICE CODE		
17. SECURITY CLASSIFICATION OF REPORT	18. SECURITY CLASSIFICATION OF THIS PAGE	19. SECURITY CLASSIFICATION OF ABSTRACT	20. LIMITATION OF ABSTRACT UL	

NSN 7540-01-280-5500

Standard Form 298 (Rev. 2-89)
Prescribed by ANSI Std. Z39-18
298-102

53-85

DTIC QUALITY INSPECTED 4

19990712 029

PART 1

Characterization of Biologically Produced Colored Dissolved Organic Matter

Daniel J. Repeta
Woods Hole Oceanographic Institution
Marine Chemistry and Geochemistry
Woods Hole
MA
02543-1543

Phone (508)-289-2635
FAX (508)-457-2164
drepeta@whoi.edu

Grant# N00014-98-1-0579

ONR Program Officer: Anna Palmisano/ Linda Chrisey

Long term Research Objective: Colored dissolved organic matter (CDOM) is one of the principal light-attenuating components of seawater. Over the past decade considerable progress has been made in describing the optical properties of CDOM. However, our understanding of CDOM structure and chemistry has not advanced apace, and we do not yet understand many of the factors that introduce and remove CDOM in seawater. Our objectives are to chemically characterize CDOM and to develop techniques for studying CDOM cycling in seawater. Recent work suggests that a large fraction of marine DOM consists of complex carbohydrates and proteins that are produced directly from biosynthesis, yet are biologically refractory towards microbial degradation. Previous studies have also suggested that a large fraction of CDOM is associated with biological activity. We wish to determine if marine phytoplankton and bacteria produce significant quantities of CDOM, and to compare the chemical characteristics of biologically produced CDOM with CDOM in seawater.

Science and Technology Objectives: In our current ONR award we are evaluating the production of CDOM by different class of marine phytoplankton in culture (diatoms, dinoflagellates, prymnesiophytes, cyanobacteria, and prochlorophytes). We are also evaluating the efficiency of several ultrafiltration and resin adsorption techniques from removal and ultimate recovery of CDOM from seawater and culture media. Techniques developed in the first stages of our project will be used to remove CDOM from select cultures for chemical characterization.

Approach: Axenic (bacteria-free) cultures of phytoplankton representative of the major class of marine algae in seawater are grown in CDOM free seawater media. The algae are removed by filtration and the media is processed by ultrafiltration (1kD and 0.5 kD membranes) and/or resins (XAD, octadecyl-silica) to remove CDOM. CDOM collected by resin adsorption is recovered by elution. The optical properties of both the recovered

and non recoverable CDOM are determined (absorption, fluorescence, Ex/Em) and CDOM concentrates are characterized by spectrometric (NMR/IR/MS) and molecular chemical techniques.

Science and Technology Completed: Over the past year we have initiated axenic cultures of *Chaetoceros neogracile*, *Emiliana huxleyii*, *Amphidinium carterae*, and *Prochlorococcus* sp. CDOM is recovered by ultrafiltration and/or XAD/Octadecyl resins. The recoveries, optical and chemical properties of CDOM are currently being measured.

Impact/Navy Relevance: CDOM rapidly attenuates light in seawater and is a major impediment to the use of in-situ optical and remote sensors for environmental monitoring.

Planned Research Efforts: ONR supports a large number of research projects which are effected by the optical properties of CDOM. Progress in seawater optics is limited by our understanding of CDOM chemistry. Our research program is designed to advance our understanding of CDOM chemistry and biology so that more effective approaches can be developed for understanding the optical and photochemical properties of CDOM.

Other sponsored Science and Technology: Please see the following two pages.

CURRENT AND PENDING SUPPORT

The following information should be provided for each investigator and other senior personnel. Failure to provide this information may delay consideration of this proposal.			
Investigator: Repeta, Daniel J.		Other agencies to which this proposal has been/will be submitted.	
Support: <input checked="" type="checkbox"/> Current <input type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *Transfer of Support Project/Proposal Title: WHOI Education Program			
Source of Support: WHOI Education			
Total Award Amount: \$		Total Award Period Covered: 1/1/99 to 12/31/99	
Location of Research: Woods Hole Oceanographic Institution			
Person-Months Per Year Committed to the Project.		Cal: 2.6	Acad: Sumr:
Support: <input checked="" type="checkbox"/> Current <input type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *Transfer of Support Project/Proposal Title: Speciation and Structural Characterization of Plutonium and Actinide-organic Complexes in Surface and Groundwaters (K. Buesseler, Co-PI)			
Source of Support: DOE; DE-FG07-96ER14733			
Total Award Amount: \$		Total Award Period Covered: 9/1/96 to 8/31/99	
Location of Research: Woods Hole Oceanographic Institution			
Person-Months Per Year Committed to the Project.		Cal: 4/3/3	Acad: Sumr:
Support: <input checked="" type="checkbox"/> Current <input type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *Transfer of Support Project/Proposal Title: Collaborative Studies on Pigments in Seawater and Marine Sediments			
Source of Support: NSF; INT-9512876			
Total Award Amount: \$		Total Award Period Covered: 9/1/96 to 8/31/99	
Location of Research: Woods Hole Oceanographic Institution			
Person-Months Per Year Committed to the Project.		Cal: 0	Acad: Sumr:
Support: <input checked="" type="checkbox"/> Current <input type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *Transfer of Support Project/Proposal Title: Characterization of Biologically Produced Colored Dissolved Organic Matter			
Source of Support: ONR; N00014-98-1-0579			
Total Award Amount: \$		Total Award Period Covered: 9/1/98 to 8/31/00	
Location of Research: Woods Hole Oceanographic Institution			
Person-Months Per Year Committed to the Project.		Cal: 2/1.5	Acad: Sumr:
Support: <input checked="" type="checkbox"/> Current <input type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *Transfer of Support Project/Proposal Title: Chlorophyll dN-15: An Isotopic Benchmark for Understanding N Cycling and Paleochemistry in the Mediterranean Sea			
Source of Support: NSF; OCE-9711702			
Total Award Amount: \$		Total Award Period Covered: 9/15/97 to 8/31/00	
Location of Research: Woods Hole Oceanographic Institution			
Person-Months Per Year Committed to the Project.		Cal: 3/3/4	Acad: Sumr:

*If this project has previously been funded by another agency, please list and furnish information for immediately preceding funding period.

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Investigator: Repeta, Daniel J.	Other agencies to which this proposal has been/will be submitted.		
Support: <input checked="" type="checkbox"/> Current <input type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *Transfer of Support			
Project/Proposal Title: Dissolved Organic Nitrogen and Brown Tide Blooms in Long Island Coastal Waters			
Source of Support: NSF; OCE-9730015			
Total Award Amount: \$		365,386	Total Award Period Covered: 4/1/98 to 3/31/01
Location of Research: Woods Hole Oceanographic Institution			
Person-Months Per Year Committed to the Project.		Cal: 1.5/1.5/1.5	Acad: Sumr:
Support: <input checked="" type="checkbox"/> Current <input type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *Transfer of Support			
Project/Proposal Title: Chemical Characterization and Biogeochemical Cycling of UDOM in Seawater			
Source of Support: NSF: OCE-9818654			
Total Award Amount: \$		380,000	Total Award Period Covered: 3/1/99 to 02/28/02
Location of Research: Woods Hole Oceanographic Institution			
Person-Months Per Year Committed to the Project.		Cal: 3/3/3	Acad: Sumr:
Support: <input type="checkbox"/> Current <input checked="" type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *Transfer of Support			
Project/Proposal Title: Carbon Budgets in the NW Atlantic Ocean Margin: A Synthesis and Modeling Project			
Source of Support: Skidaway/NSF Subcontract; WHOI Proposal No. 2157.1			
Total Award Amount: \$		25,243	Total Award Period Covered: 6/1/99 to 5/31/01
Location of Research: Woods Hole Oceanographic Institution			
Person-Months Per Year Committed to the Project.		Cal: 1/0.5	Acad: Sumr:
Support: <input type="checkbox"/> Current <input checked="" type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *Transfer of Support			
Project/Proposal Title: Acquisition of a Nuclear Magnetic Resonance Spectrometer for Biogeochemical Research			
Source of Support: NSF; WHOI Proposal No. CH10301			
Total Award Amount: \$		251,850	Total Award Period Covered: 10/1/99 to 9/30/00
Location of Research: Woods Hole Oceanographic Institution			
Person-Months Per Year Committed to the Project.		Cal: 0	Acad: Sumr:
Support: <input type="checkbox"/> Current <input checked="" type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *Transfer of Support			
Project/Proposal Title: Speciation, Mobility and Fate of Actinides in the Groundwater at the Hanford Site			
Source of Support: DOE EMSP; WHOI Proposal No. CH10331			
Total Award Amount: \$		1,198,161	Total Award Period Covered: 9/15/99 to 9/14/02
Location of Research: Woods Hole Oceanographic Institution			
Person-Months Per Year Committed to the Project.		Cal: 1/1/1	Acad: Sumr:

*If this project has previously been funded by another agency, please list and furnish information for immediately preceding funding period.

PART 2

**Characterization of Biologically Produced
Colored Dissolved Organic Matter**

**Daniel J. Repeta
Woods Hole Oceanographic Institution
Marine Chemistry and Geochemistry
Woods Hole
MA
02543-1543**

**Phone (508)-289-2635
FAX (508)-457-2164
drepeta@whoi.edu**

Grant# N00014-98-1-0579

ONR Program Officer: Anna Palmisano/ Linda Chrisey

Subcontractors: 0

Journal publications appearing in print: 0

Formal technical reports released by your institution: 0

Presentations (indicate invited presentations): "Biological production of colored dissolved organic matter" ONR CDOM workshop, Baltimore, MD, April 1999.

Books or book chapters published: 0

Patents (indicate status, e.g., filed, issued): 0

Honors, awards or prizes received during the reporting year: 0

Number of Students Supported (minimum of 1/4 of their support): 0

Post Doctoral: 0 Doctoral: Masters: Undergraduate:

Of these students, the number who were:

Females: 0

Under-represented Ethnic groups: 0